The Utah Basic Skills Competency Test Framework
Mathematics Content and Sample Questions
June 3, 2006

Utah law (53A-1-611) requires that all high school students pass the Utah Basic Skills Competency Test in order to receive a basic diploma. The mathematics portion of this test measures a student's knowledge of arithmetic, algebraic reasoning, basic geometry concepts, collecting and organizing data, and creating and analyzing graphs. These concepts are taken from the curriculum in grades 4 through 10.

Students will be allowed to use calculators on all but one section of the test. This section is intended to measure basic computational skills.

The purpose of this document is to provide sample questions to help parents and students understand the type of questions that will be on the test. Questions on the Utah Basic Skills Competency Test will be presented in multiple-choice format, but for simplicity sample questions in this document are not in multiple-choice format. Test items may or may not be in context.

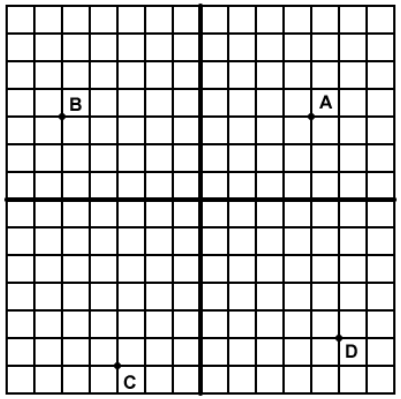
THE SET OF SAMPLE QUESTIONS IS NOT INTENDED TO BE COMPREHENSIVE.

Standard 1: Numbers and Operations (Arithmetic)

Framework		Explanation
	Compute fluently and make reasonable estimates.	All students are expected to be able to add, subtract, multiply, and divide. This does not mean all students will have instant recall, but it does mean students will be able to compute efficiently and accurately.
1.1	Perform operations of addition, subtraction, multiplication, and division using whole numbers, fractions, decimals, and integers. (**No Calculator Allowed**)	**Examples** Questions may involve stand-alone calculations. a. 59×26 b. $\frac{458}{25}$ c. 392 + 491 + 875 d. 658 – 279 e. $3\frac{5}{6} \bullet 2\frac{2}{5}$ f. 4.06×6.3 g. 150 – 394 h. $-22*51$ i. $1.2\overline{)276}$ j. -15 – (-21) k. 12 + (-22) Questions may be in the form of a problem to solve. a. Juan had 437 baseball cards. He gave 118 cards to his sister. How many cards does Juan have left? b. Bundles of birdseed are being prepared for a wedding reception. Each bundle contains $\frac{1}{8}$ cup of birdseed. 250 guests are expected for the reception. How many cups of birdseed will be needed? Questions may contain more than one step. a. If a hat and shirt are purchased together the store will give a 20% discount. If the hat and shirt together sell for $40.00, what is the selling price after the discount?
1.2	Compare and arrange numbers in order. (**No Calculator Allowed**)	a. Arrange the following list of numbers in order from **least to greatest**: $\frac{3}{2}$, 0.10, 1.0, $\frac{1}{3}$, -1 b. The value of $\sqrt{58}$ lies between which two whole numbers? c. Arrange the following list of numbers in order from **largest to smallest**: 2^2, -10, 8, $\sqrt{36}$, 3.8, $\frac{12}{5}$

Framework		Examples
1.3	Simplify mathematical expressions involving exponents using the order of operations. (**No Calculator Allowed**)	a. Simplify: $9 + 24 \div 8 - 5$ b. Simplify: $4^2 - 3(15 - 8)$ c. Simplify: $2^3 \times 2 \times 2^4$ d. Simplify: $\frac{4^2 - 10}{2}$
1.4	Recognize, duplicate, extend, and make predictions using patterns. (**Calculator Allowed**)	a. If the first four terms of a list of numbers are 1, 4, 9, and 16, what is the seventh term of the list? b. The first four terms of a list of numbers are 3, 7, 11, and 15. What is the ninth term of the list? c. If a cell phone company charges a monthly service fee of $20.00, and ten cents ($.10) for each minute of use, what would the cost of phone service be for 0, 1, 10, 100, and 1,000 minutes?

Standard 2: Algebraic Reasoning

Framework		Explanation
	Recognize and use relations and functions. Solve equations, simplify algebraic expressions, multiply one expression by another, and evaluate formulas or equations for given values.	"People who don't understand algebra today are like those people who couldn't read or write in the industrial age. Computers have made elementary mathematics as important as reading and writing. Knowing algebra is the new floor, so to speak. To participate fully in the world driven by computer technology, to be able to get a job that supports a family, you have to be literate in math—and that requires that you have to be at least literate in algebra by the time you go to high school" (Checkley, *Educational Leadership*, vol. 59, p. 6, 2001).
2.1	Plot points on a coordinate system when given ordered pairs of values. Graph linear functions (straight lines) when given a table of values or the x- and y-intercepts. (**No Calculator Allowed**)	**Examples** a. Plot the following points A, (4, -3); B, (2, 5); C, (-5, 4); and D, (-3, -1) on a coordinate system. b. Write the ordered pairs that correspond to the following points. 

<table>
<tr><th colspan="2">Framework</th><th>Examples</th></tr>
<tr><td>2.1</td><td>(Continued)</td><td>a. Identify a point or region on a map when given a set of coordinates such as (D, 4).

b. Draw a graph representing the data in the given table:
<table><tr><td>X</td><td>-1</td><td>0</td><td>1</td><td>2</td></tr><tr><td>Y</td><td>2</td><td>-1</td><td>-4</td><td>-7</td></tr></table>
c. Draw the graph of a linear equation that has an x-intercept of (5, 0) and a y-intercept of (0, -2).</td></tr>
<tr><td>2.2</td><td>Simplify algebraic expressions using addition, subtraction, multiplication, and division; e.g., a monomial times a monomial, a monomial divided by a monomial, a monomial times a binomial, and combining like terms.

(No Calculator Allowed)</td><td>a. Simplify: $4x(2y + 3)$

b. Simplify: $2x^2 + 3x - 10x - 15$

c. Simplify: $\frac{15y^5}{3y^2}$

d. Simplify: $2(x + y)$

e. Simplify: $2a(a + b)$

f. Simplify: $a(2 + 3)$</td></tr>
<tr><td>2.3</td><td>Use proportions to solve for unknown values.

(No Calculator Allowed)</td><td>a. Solve for y: $\frac{8}{3} = \frac{y}{9}$

b. An owner of a donut shop knows that two out of every five of his customers will order glazed donuts. He sells 4,750 donuts on a normal day. How many glazed donuts will he need to make?</td></tr>
<tr><td>2.4</td><td>Solve single variable linear equations.

Calculate the value of an expression or formula.

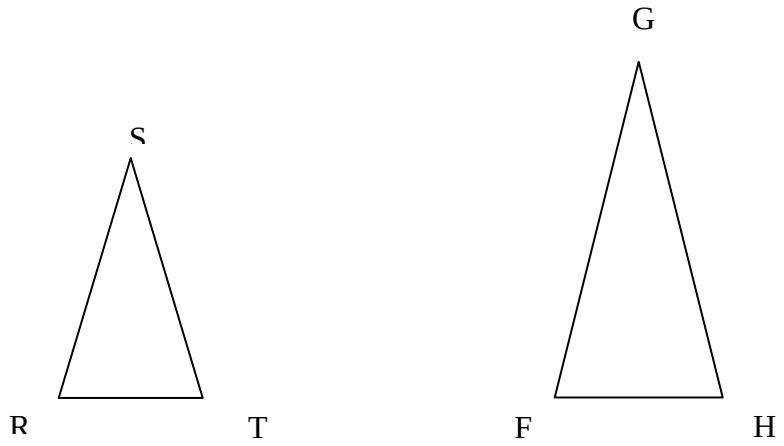
(No Calculator Allowed)</td><td>a. Mary worked for three hours and was paid $21. What was her hourly rate of pay? ($3x = 21$)

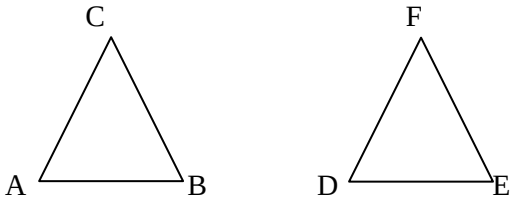
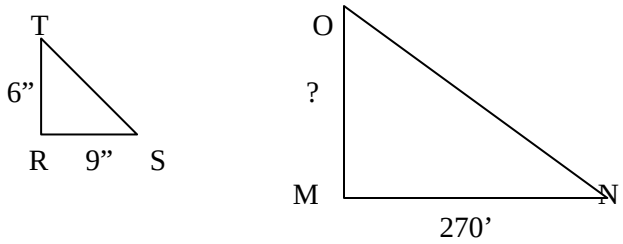
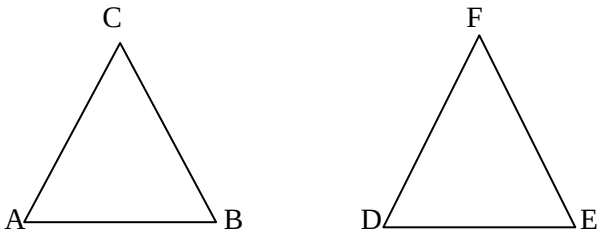
b. Frank wants to go on a trip that will cost $5,150. His grandmother gave him $350 for his trip. He can save $120 a month for the trip. How many months will it take Frank to save enough money for his trip? ($120m + 350 = 5,150$)

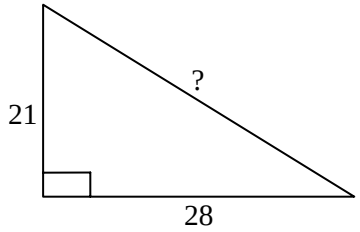
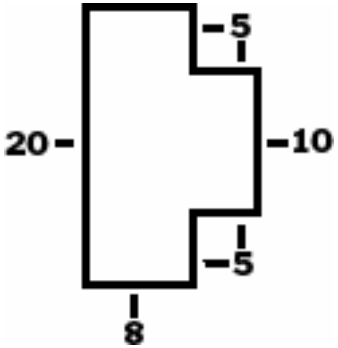
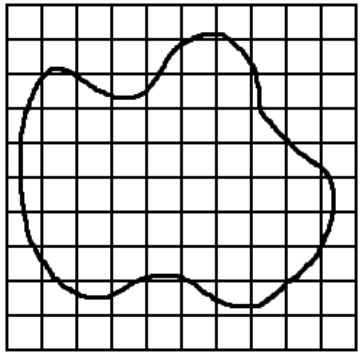
c. A gym charges nonmembers $16 per day to use the gym and an equipment rental fee of $8 per day. Members are charged $450 for a yearly membership for unlimited use of the gym and a $6 per day for equipment rental. How many times must a member use the gym to justify a yearly membership? ($16x + 8x = 450 + 6x$)</td></tr>
</table>

Framework		Examples
2.4	(Continued)	d. Solve for m: $\frac{2}{3}m = 45$ e. Solve for h: $3(h - 2) = 15$ f. Solve for s: $4s - 7 = 2s + 13$ g. What is the value of $3x^2 - x + 5$ when $x = -3$? h. Evaluate: $4x^3 - 6x$ when $x = 2$ i. Is $x = -2$ a solution for $2x + 7 = 1 - x$? j. Firefighters use the formula $d = \frac{n}{2} + 26$ to determine the distance d the water will travel when there is a given nozzle pressure n. Nozzle pressure is measured in pounds per square inch and d is measured in feet. If the nozzle pressure is 48 pounds per square inch, what distance will the water travel?

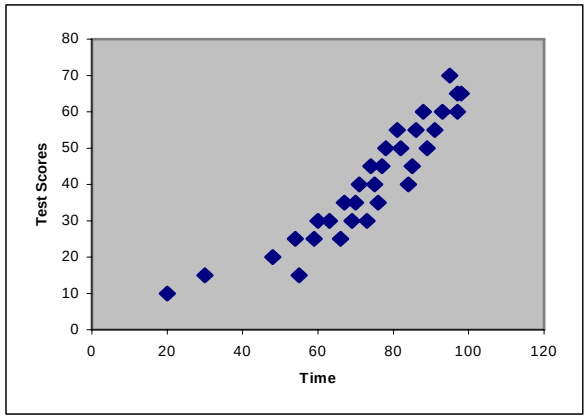
Standard 3: Geometric Reasoning and Measurement

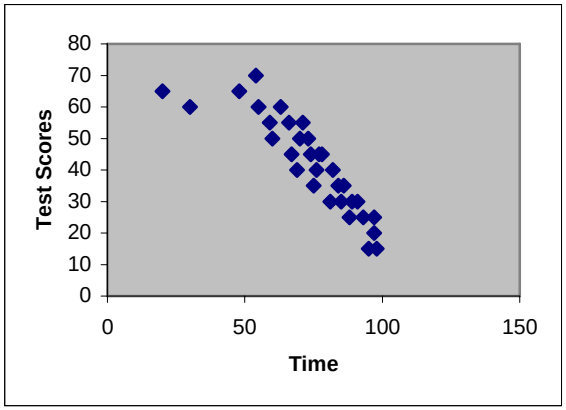
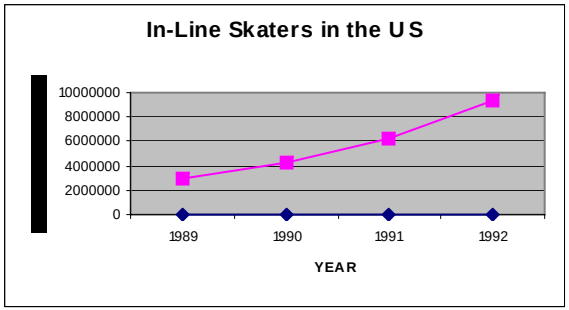
	Framework	Explanation
	Use geometric reasoning and measurement skills to solve problems involving concepts of similar and congruent geometric figures, solve for unknown values involving geometric shapes, calculate areas and volumes of regular and irregular shapes, determine the correct units of measure and lengths when using scale drawings, and convert units of measure in the same system.	"Through the study of geometry, students will learn about geometric shapes and structures and how to analyze their characteristics and relationships. The ability to visualize objects and determine how they will appear as they are moved and rotated is an important part of geometry. Geometry is a natural place for the development of students' reasoning and justification skills. Geometric modeling and spatial reasoning offer ways to interpret and describe situations in the student's environment and can be important tools in problem solving" (*NCTM Principles and Standards for School Mathematics*, p. 41).
3.1	Identify congruent and similar figures and be able to calculate unknown values in these figures and scale drawings. (**Calculator Allowed**)	**Examples** 1. Given: Triangle RST with sides of lengths: RS = 6, ST = 6, RT = 3. Triangle FGH with sides lengths of FG = 12, GH = to 12, and FH = 9. Are the following figures similar? (figures are not drawn to scale) 

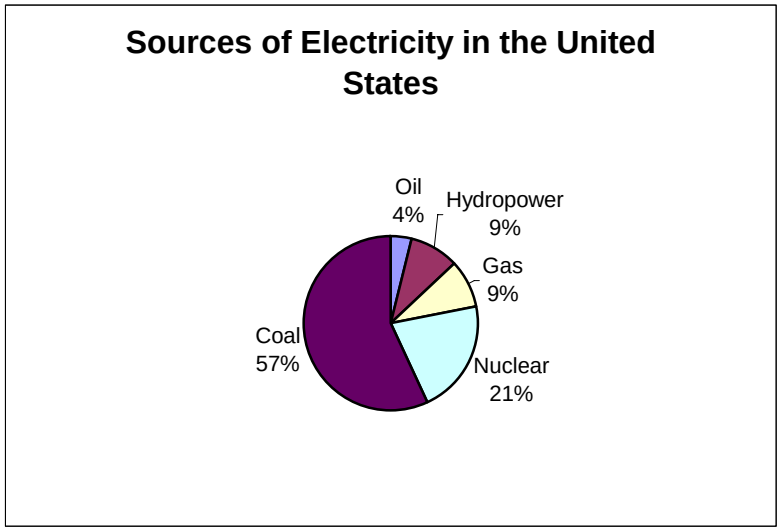
Framework		Examples
3.1	(Continued) (**Calculator Allowed**)	a.  In triangles ABC and DEF, the measures of angles A and D and the measures of angles B and E are equal. Are the triangles similar? b.  Triangle RST is part of a blueprint for a flower garden in a park. The length of side RT is 6 inches and the length of side RS is 9 inches. Triangle MNO is in the flower garden in the park and is similar to triangle RST. If side MN is 270 feet in length, how long is side MO? c. A set of plans gives the scale of $\frac{1}{4}$ inch = 1 foot. A doorway between two rooms measures $1\frac{3}{4}$ inches on the plans. How wide will the doorway be in the building? d.  Given triangles ABC and DEF, where the measures of angles A and D and the measures of angles B and E are equal, and the sides AB and DE are equal. Are the triangles congruent?

Framework		Examples
3.2	Calculate areas, surface areas, perimeters, volumes, and unknown sides or angles of geometric figures using the formulas provided. (**Calculator Allowed**)	a. A room having two walls 8 feet high and 12 feet long and two walls 8 feet high and 10 feet long is to be painted. If the walls and ceiling are to be painted, what is the surface area to be painted? b. A floor with a surface area of 216 square feet is to be carpeted. How many **square yards** of carpet will be needed to cover the floor? c.  A cable is to be strung from the top of a 21-foot-high pole to the base of a building 28 feet away. How much cable will be needed?
3.3	Calculate and/or estimate the area of irregular shapes by dividing them into smaller geometric figures or by using a grid system. (**Calculator Allowed**)	 

Standard 4: Data, Statistics, and Probability

Framework		Explanation
	Collect, organize, display, analyze, and make reasonable predictions based on a data set, and be able to calculate the probability of an event or outcome.	"Students need to know about data analysis and related aspects of probability in order to develop the skills necessary to become informed citizens and intelligent consumers. Work in data analysis and probability offers a natural way for students to connect mathematics with other school subjects and with experiences in their daily lives" (*NCTM Principles and Standards for School Mathematics,* p. 48).
4.1	Collect, organize, display, and make reasonable predictions using frequency tables, line plots, scatter plots, pictographs, bar graphs, circle graphs, line graphs, and stem-and-leaf plots with given data sets. (**Calculator Allowed**)	**Examples** a. A scatter plot was created displaying student scores and the amount of time they studied for a test. Which of the two scatter plots best describes the expected results? **I** 

Framework		Examples
4.1	(Continued)	**II**  b. The results of a class survey of favorite types of television shows generated the following data set: Information, 25 votes; Drama, 45 votes; Comedy, 50 votes; and Sports, 40 votes. Create a pie chart and a bar graph to display the data set. c. The line graph displays the following data for in-line skaters rounded to the nearest 100,000: 1989, 3,000,000; 1990, 4,300,000; 1991, 6,200,000; and 1992, 9,400,000. In which year did in-line skating increase most rapidly? 

Framework		Example
4.1	(Continued)	d. If a home were picked at random in the United States, from what source would you predict the electricity for that home was generated using the following pie chart? 
4.2	Calculate the mean (average), median, and range and analyze data using these values. (**Calculator Allowed**)	a. Find the mean, median, and range for the given set of data: 65, 73, 45, 87, 55, and 95. b. Find the mean, median, and range for the given set of data: 65, 87, 73, 55, and 90.
4.3	Differentiate between actual and experimental estimates of probability, and represent the probability of an event as a fraction, percent, or decimal. (**Calculator Allowed**)	a. A bag has 6 red marbles, 10 green marbles, and 8 blue marbles. Express the probability of randomly selecting a red marble as a fraction, a percent, and a decimal. b. A bag contains 10 chips numbered as follows: 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10. What is the probability of randomly selecting a chip with a number of 4 or less? c. A bag contains red, blue, green, and yellow chips. A chip is drawn, the color of the chip is recorded, and then the chip is replaced. A red chip was drawn 6 times, a blue chip was drawn 3 times, a green chip was drawn 5 times, and a yellow chip was drawn 10 times. Based on this data, what fractional part of the chips in the bag are most likely to be red?